R E P O R T R E S U M E S

ED 017 401 RE 001 027

STUDIES OF ORAL READING--XII. EFFECTS OF INSTRUCTIONS ON THE EYE-VOICE SPAN.

BY- LEVIN, HARRY COHN, JULIE A.
CORNELL UNIV., ITHACA, N.Y.

PUB DATE JUL 67

EDRS PRICE MF-$0.25 HC-$1.28 30P.

DESCRIPTORS- *ORAL READING, *EYE MOVEMENTS, *READING COMPREHENSION, *READING PROCESSES, *EYE VOICE SPAN, MOTIVATION, READING ABILITY,

ONE MEASURE CURRENTLY USED TO DESCRIBE THE READING PROCESSES IS THE EYE-VOICE SPAN OR EVS. THE EVS IS DEFINED AS THE DISTANCE OR SPAN OF WORDS THAT THE EYE IS AHEAD OF THE VOICE IN ORAL READING. THE EFFECTS OF DIFFERENT INSTRUCTIONALLY-INDUCED SETS UPON THE EYE-VOICE SPANS OF READERS AT VARIOUS ELEMENTARY AND HIGH SCHOOL LEVELS WERE INVESTIGATED. THE SUBJECTS WERE 60 PUPILS FROM THE ITHACA, NEW YORK, PUBLIC SCHOOLS FROM GRADES 2, 4, 9, AND 11. EACH SUBJECT WAS REQUIRED TO READ SHORT SELECTIONS TYPED ON 5" X 7" CARDS WHICH WERE INSERTED INTO A 24" X 18" X 12" BOX. THIS BOX WAS LIGHTED WHEN THE EXPERIMENTER DESIRED THE SUBJECT TO READ THE PRINTED MATERIAL, AND THE LIGHT WAS TURNED OFF WHEN THE EXPERIMENTER SO DESIRED. THERE SEEMED TO BE A NOTABLE FLEXIBILITY OF THE EVS, REFLECTING CHANGES IN THE CENTRAL PROCESSES OF APPREHENSION AND COMPREHENSION. EYE MOVEMENTS APPEARED TO BE DICTATED BY CONSCIOUS PROCESSES ACTIVATED SUBSEQUENT TO THE INSTRUCTION-INDUCED SET FOR THE PURPOSE OF READING. IT WAS DEMONSTRATED THAT DIFFERENT INSTRUCTIONS PRODUCED SIGNIFICANT CHANGES IN THE READING BEHAVIOR OF THE SUBJECTS. THE EVS VARIED WITH INSTRUCTIONS IN THE SAME WAYS AS EYE MOVEMENTS. THREE TABLES SHOWING STATISTICAL DATA AND A BIBLIOGRAPHY ARE INCLUDED. (JM)

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

ED017401

RE001 027

PRELIMINARY DRAFT
July 1967

Studies of Oral Reading:

XII. Effects of Instructions on the Eye-Voice Span

Harry Levin and Julie A. Cohn[1/]

Cornell University

As mature readers, we are all at least vaguely aware that reading is not a unitary, static process; that, in fact, we read somehow differently -- although we may not realize exactly how so -- when we are reading different types of material and when reading for different purposes. It is this latter phenomenon which is dealt with in this study, namely the differential reading styles elicited by various mental sets. Instructions to read for certain purposes serve here to produce these different reading attitudes.

One measure currently used to describe the reading processes is the eye-voice span, or EVS. The eye-voice span is defined as the distance, or span of words, that the eye is ahead of the voice in oral reading. After its initial mention by J.O. Quantz in 1897, the phenomenon was studied to a considerable extent throughout the 1920's, when research in reading focused primarily on the eye-movements involved. It was generally believed then that techniques for reading improvement should involve the training of the oculo-motor system, such that the eye-movements of the poorer readers could be made to resemble those of the better readers.

1/This study is based on a Senior Honors Thesis submitted to the Psychology Department by the junior author.

Quantz, without resort to any of the elaborate eye-movement camera recording devices such as were subsequently developed, utilized the simple procedure of quickly slipping a card over the page while the subject was reading, and then recording the number of words spoken after the view was thus cut-off. Recently, renewed interest in the eye-voice span has concentrated not on the eye-movements involved, but rather on the central processes which govern it and upon the syntactic structure of the reading material affecting the eye-voice span as a chunking or decoding unit. The modern experimental apparatuses are modifications and refinements of Quantz's model, similarly cutting-off the subjects's view of the reading matter -- by shutting off the light which had allowed him to see it through a one-way mirror, or turning off the projector which had projected a slide of the passage on a screen -- and asking him to repeat whatever additional words he remembers having seen.

As a flexible, elastic unit, the eye-voice span has been demonstrated to increase and decrease in size due to the effects of certain stimulus and subject variables. Dealing first with the stimulus determinants -- characteristics of the reading material itself -- some contradictory evidence has been reported.

Quantz (1897) and Fairbanks (1937) reported that the position of the cut-off within the line of printed matter exerted a definite and consistent influence; specifically, that the EVS, measured at the beginning of a line is longest, that at the end of the line is shortest, and that central in the line is of intermediate length. Presumably the

RE001 027

span is narrowest at the end of the line because the eyes pause to wait for the voice to catch up. Accordingly, Judd (1918) found that in addition to the one pause per word generally occurring in oral reading, there is also this long pause at the end of the line.

Buswell (1920; 1936) on the other hand, did not corroborate this finding; his studies demonstrated no effect of position within a line. Rather, he maintains that the differential EVS's reflect position within the sentence. Fairbanks (1937) and Vernon (1931) feel that both variations can occur. Buswell's good readers and all of Fairbank's subjects exhibited their longest EVS's at the beginning and the shortest EVS's at the end of the sentence. To Buswell (1920):

> The fact that the EVS varies with the position in the sentence is of considerable significance. If the span varied only with the position within the line, as Quantz's study indicated, the determining factors would be entirely mechanical and would be governed by the printed form of the selection. The control of the span, in that case, would be a matter of the mechanics of book construction and would be independent of any teaching factor. But if the span varies with position in the sentence, it is evident that the content of meaning is recognized, and that the EVS is determined by thought units rather than by printed line units. Position in the line may be a minor factor...but the differences due to position in the sentence are much greater.

This is rather a sophisticated statement for 1920. In his concentration on the meaningful sentence as influential on the EVS, Buswell seems to anticipate the recent emphasis on its grammatical determinants. He suggests that the EVS "allows the mind to grasp and interprete" a unit of meaning before the voice must express it, but does not offer evidence, however, to back his hypothesis that the

chunks necessarily be meaningful phrase units, as Anderson (1937) also suggests. Therefore, a trend of exploration is currently directed toward the grammatical phrase structure of the sentence itself. Much earlier, in 1897, Catell had deduced from his findings -- that subjects could just as readily recognize tachistoscopically presented words, phrases and short sentences as they could single letters -- that the units of perception could be words, phrases or even sentences. Likewise, Tinker (1958) expressed the opinion that reading units, rather than in terms of spelling or syllabizing, are in terms of word groupings which form perceptual "wholes." Recently Schlesinger (1965), defining the EVS to be a "unit of decoding," predicted that these could be understood with reference to the syntactical structure of the stimulus materials. Accordingly, Levin and Turner (1966) found their subjects to read to phrase boundaries significantly more often than to non-phrase boundaries, suggesting again that the decoding unit be of phrases. At least with their adult subjects, Levin and Turner also revealed that the grammatical sentence-voice produced an effect on the EVS, and this effect -- that passive target sentences yielded significantly longer EVS's -- was replicated by Levin and Kaplan (1966). They accounted for this tendency on the basis of the greater constraint of the passive form. This inference follows from the fact that Lawson (1961) and Morton (1964) had found the length of the EVS to be directly related to the contextual constrain, or information content, of the reading matter, and that Clark (1965, 1966) and Roberts (1966) have shown the passive voice to be more predictable, more constrained, than the active voice.

Still other experimenters have considered additional elements of the nature of the reading material, focusing on the content, rather than structural properties. It has been reported consistently, for example, that the more difficult the reading matter is, the shorter the resultant EVS (Buswell, 1920; Anderson, 1937; Fairbanks, 1937; Huey, 1922; Tinker, 1958). On the other hand, Ballantine (1951) and Morse (1951), dealing not specifically with the EVS, but comparing the eye-movements of children reading selections appropriate to their grade and geared to grades two years above and below their own, found the eye-movements to be quite consistent, not changing in any predictable way with the change of two years in difficulty. Tinker dismisses such findings as resultant from an "unfortunate lack of flexibility" in these subjects, hampering their ability to adjust their pace and procedures in accordance with the difficulty of the passage. This seems to be a weak and rather defensive argument however. If indeed the lack of change in these subjects' eye-movements was due to their lack of flexibility, then their lack of flexibility itself is a valid phenomenon, necessitating acknowledgement and further explanation.

Ledbetter (1947) found differences in the eye-movements in reading of material from various subject areas, although the selection were controlled for length, vocabulary difficulty and sentence structure. That the greatest sources of difficulty were in the reading of poetry and mathematics "seems to point to the conclusion that meanings or concepts present more difficulty to the average student than vocabulary, sentence length or sentence structure, and that certain subject matter

fields have inherent difficulties." Yet Tinker accounts for such results with resort to probable differences in the familiarity, difficulty, and purpose of the reading:

> Different types of material, read with the same instructions (set) do not automatically elicit different patterns of eye-movements when the passages are equally difficult. These findings are important. The above findings do not mean, however, that reading for different purposes or reading materials with wide variations in difficulty would not produce variation in oculo-motor behavior.

Assuming content differences to be explained in terms of the degree of difficulty, we may perhaps further explain the effect of the difficulty of a selection in terms of its lesser predictability or constraint; a difficult passage is one which is not highly predictable, due either to its unfamiliar vocabulary or to the obscurity of the concepts dealt with.

Another line of investigation has been directed toward subject determinants of the eye-voice span. It has been consistently demonstrated that the EVS tends to increase with age up to adulthood (Buswell, 1920; Tinker, 1958; Levin and Turner, 1966). Also fairly well established is the fact that good readers generally have a longer EVS than poor ones (Buswell, 1920). Quantz (1897) and Levin and Turner (1966) reported that faster readers have a longer EVS than slow ones; this probably because, since most of the time involved in reading is in fixational pauses, faster readers, with fewer pauses, must take in more information at a single pause. As Morton (1964a) has used reading rate as his criterion for determining good versus poor readers, it seems that the two are inextricably related.

Fairbanks (1937) holds that the difference between good and poor readers are of a central nature, reflecting comprehension as it is modified by the reading attitude, and variations of mental activity as determined by the difficulty the reading matter presents to the subject. After an analysis of their EVS's and errors, revealing that faulty eye-movements cannot have caused the errors, he concluded that the errors must be central in origin and that other peripheral manifestations of reading likewise must have similar dependence upon central processes. This is consistent with Anderson and Tinker who express a similar opinion, that eye-movements in reading vary with central, rather than ocul-motor processes. Says Tinker (1958):

> It is now well established that oculomotor patterns are exceedingly flexible and quickly reflect any variation in the central processes of perception, judgement, comprehension, etc. In other words, it appears that eye-movement patterns merely reflect ease or difficulty of reading performance and degree of comprehension, rather than cause good or poor reading. Versatility in adjustment of reading habits to variation in purpose and materials is one "hallmark" of maturity in reading.

The notion of reading attitude or set (as determined by purpose, for example) has thus been acknowledged by several investigators as a determinant of eye-movements. Most experimental evidence in this area does not deal directly with the eye-voice span, but rather with the recording of various eye-movement measures, primarily in silent reading. However, since some of these measures -- forward shift of the eyes, size of fixation, etc. -- appear to be involved in the eye-voice span, the results of these experiments seem to be highly relevant here.

C. T. Gray (1917) contended that although the length of pauses did not vary in any large degree, the number of pauses and regressive movements did change appreciably with the different types of reading his subjects were asked to do, increasing when the subjects were required to answer questions about the material. Thus there was a demonstrated tendency to read in smaller units when they were to be questionned than when asked to reproduce only a general thought. His results, typical of all subjects, indicate clearly that the reader does differentiate between types of reading and evidently approaches different reading problems with different mental sets. An even clearer statement of similar results is reported by Judd and Buswell (1922) who, finding a general tendency to increase the number and decrease the duration of fixational pauses, in addition to the expected increase in regressions, with detailed reading, infer again that a mental set for close reading is answered by a procedure utilizing smaller reading units, while larger units are employed for more superficial reading. Even greater differences were yielded when the subject was instructed to paraphrase the material; this highly detailed reading set required even smaller units of analysis. Vernon (1931) claims that reading is most irregular when disturbed by conflicting interests or emotional tensions; pressure to read quickly or to learn all the details at a single reading may produce irregularity and confusion in the reader.

Anderson (1937) compared eye-movements utilized by good versus poor readers in response to different instructionally-determined attitude sets for their silent reading. With regard to the mean duration

of fixations, the shortest pauses of the good readers resulted from instructions to read for the general idea, while poor readers demonstrated their shortest pauses under the normal condition ("to obtain a moderate knowledge of the text"). On all measures of eye-movements, the instruction to read for the general idea yielded the largest differences between good and poor readers. The size of fixations decreased to almost a common figure under the detailed reading condition. The largest mean forward shifts were found under the general idea condition, followed by the moderate knowledge condition, and smallest in the detailed reading condition, although these measures were consistently greater for good readers than for poor ones. Rate of reading followed a parallel pattern. Although these measures did not deal directly with the eye-voice span; they would seem relevant to it as movements which comprise the scanning of the eyes ahead of the voice, and therefore seem to suggest that similar results would be found with the EVS measure.

The differential results for these different reading conditions illustrate the flexibility of the eye-movement patterns in accordance with the varied mental processes and the fact that the good readers demonstrated a wider variation in habits, especially in the general idea condition, and least for the detailed reading condition seems to imply that good readers are more adaptable than poor ones, and that the norm of the poor reader lies closer to the careful word-by-word reading procedure characteristic of both detailed and immature reading. Laycock (1955) studying the oculo-motor patterns

of this flexibility phenomenon in college readers, found that when told to read faster, both groups increased their rate, but the flexible group increased it more. The flexible group likewise increased their average fixation span by 31%, the inflexible group by 17%, and although both groups decreased their duration of fixation, the flexible group saved twice as much time at each fixation.

In sum, evidence to date has concentrated on two main points of focus in investigation of the eye-voice span. Along the lines suggested earlier by Busewell, one trend of exploration has centered on the structural properties of the sentence as these affect the length of the EVS. The eye-voice span has come to be considered as a unit of decoding -- in terms of meaningful phrase units. Contextual constraint, or predictability, has been recognized as an important determinant of the EVS, and one which seems to explain such findings as the increased EVS elicited by difficult material, and the differential EVS with active and passive sentences. Another line of approach has dealt with the effects of subject variables. In addition to concrete factors like age and reading rate of the subjects, investigation have also attempted to deal with the more illusive central processes -- comprehension, perception, attitude set -- as these affect the EVS. It is felt that the flexible oculo-motor patterns result from these central determinants rather than vice versa. Different reading styles are utilized by readers with different reading attitudes -- as determined by the purpose of the reading -- yet the degree of difference depends upon the maturity and flexibility of the reader. Findings on

eye-movements, especially in silent reading, suggest that closer, more detailed reading, utilizing smaller chunking units, would therefore exhibit shorter EVS's than normal; whereas broader reading, resembling skimming, involves longer forward shifts and, by implication, longer eye-voice spans.

In the present experiment, the effects of different instruction-imposed attitudinal sets will be investigated as they relate directly to the eye-voice span in oral reading. Utilizing elementary and high school students, a developmental approach may be considered. It is hypothesized that: (1) mental set for detailed reading will yield a decrease in EVS resulting from the smaller-than-normal chunking units, whereas reading for a general idea should yield a longer EVS than normal; (2) the EVS should increase with the grade level of the subjects; and (3) the older subjects would be expected to show a greater range of variation in EVS with the different instructions than the younger readers, due to the greater flexibility of mature reading processes.

METHOD

Subjects. The subjects were sixty students from the public schools in Ithaca, divided as follows:

fifteen subjects (seven boys and eight girls) from the second grade at West Hill School;

fifteen subjects (six boys and nine girls) from the fourth grade in West Hill School;

fifteen subjects (nine boys and six girls) from the ninth grade at Boynton Junior High School;

fifteen subjects (five boys and ten girls) from the eleventh grade at Ithaca High School.

The selection procedures varied. At West Hill School, the children were chosen at random from class lists, with the principal eliminating only those who did not have a minimal second grade reading ability, since these children would be unable to read the stimulus materials. The ninth graders had been chosen by the Guidance Department at Boynton Jr. High, as a sample which they felt would be a typical cross-section of their ninth grade reading population -- some were remedial, some advanced, most classified as average readers. At Ithaca High School, the subjects were solicited from two Introduction to Psychology classes. No knowledge of the nature of the experiment was provided, and the selection was made only on the basis of their scheduled free periods.

The introduction of these several selection procedures, of course presents the problem of possible bias in the sample, due

to the various characteristics of the subjects. Even in the elementary school, the otherwise random sample may have been affected by the additions and deletions which the principal made. It is even more likely that the sample selected from Boynton was biased; the guidance counselors probably had certain reasons for the selection of these particular students. By soliciting volunteers in the high school, the possibility for a self-selection bias was introduced; and the very fact that the classes asked to participate were confined to psychology classes -- an elective which only certain students take, perhaps based on academic criteria -- may also have rendered the sample non-random.

Although, at least for the first three grade levels, the subjects had been classified by the school officials as good or poor readers, no such classification is utilized in this study. The grade level, taken as a whole, is the only factor considered.

Stimulus Materials. The reading material consisted of twenty-two short selections on each of two grade levels (reproduced in Appendix A in the same from and size of type as used in the experiment), which were typed on individual 5" by 7" cards for insertion in the reading apparatus. The passages were taken either verbatim, or with slight modification, from level A second grade and tenth grade readers as cited. The two elementary grades read second grade level material; the upper grade students read tenth grade matter.

Each selection consisted of a passage of six sentences of meaningful connected discourse. The critical sentence was either the third, fourth, or fifth sentence of the passage, always beginning on a

new line, so as to allow a sufficient number of words beyond the light-off position on the single line. Fox example:

The boys/ followed their mother into the store.

(The slash indicates the light-out point.) These critical sentences were of consistent grammatical structure: beginning with a noun phrase of either one, two, or three words, followed by a three-word verb phrase, and a three-word prepositional phrase, and, in the higher level selections, still another three-word phrase. The light-off position was always between the subject and verb phrases, so placed in the beginning of the sentence in order to allow either six words (for the younger readers) or nine words (for the older subjects) beyond this point, so that the subjects could exercise their full eye-voice span on this single line. The confounding effects of different within-line and within-sentence positions were thereby avoided.

Apparatus. The experimental apparatus consisted of a wooden box, measuring 24" X 18" X 12", with a slanted top fitted with a one-way mirror. The passages on cards were inserted behind the mirror in such a way that the subject could only see the material if the light inside the box was on. This light was operated by a microswitch; when the experimenter depressed the switch, the light turned on; when he released the switch, the light shut off. A timer was operated by the same switch, thus beginning when the light came on, and stopping immediately as the light was turned off. In this manner, the amount of time of reading, until the light-out point, was recorded.

Procedure. The subject entered the darkened experimental room and the apparatus and procedure were explained and demonstrated. The subject was told that in the middle of the passage, the light will be turned off and he will be unable to see any more of the selection, but he is requested to report whatever words he remembers of the rest of the sentence. The twenty-two selections were then presented, one at a time, in a constant order. For each subject, the first passage was presented under the "normal" reading condition, and was used mainly for demonstration or practice purposes; the results obtained from this first sentence are not included in later analyses. The other twenty-one selections were each preceded by one of three sets of instructions, geared to elicit either a normal reading set, an especially careful reading set, or a set similar to "skimming." Seven of each instructional condition comprise the set. The instructions were as follows (Parentheses denote changes for the older grade subjects):

> (1) Now, I'd like you to read me this story (passage) just the way you normally would if you were reading out loud for the teacher (to a friend).
>
> (2) Now, this time, I want you to read me the story (passage) very carefully. Pay close attention to all the details because I'm going to ask you questions about it afterwards.
>
> (3) This time, you don't have to pay such close attention to each (individual) little detail. Instead, I'd like you to just read right through for the general idea of the story.

For all those selections presented under the second condition, one question, on the details of the action, was posed.

The three conditions were arranged in a single random order, but the series began at a different point in the order for each subject, so that the same condition did not fall consistently with the same critical sentence. For example, the order began as follows: 1, 2, 1, 3, 3, 2... etc. Thus, the first subject began his first paragraph under condition one, and continued on through the series; the second subject began his series with the first selection under condition two, and finished the set with condition one, and so on. No order effect would thus be expected. In this manner, each subject served as his own control, reading seven selections in each of the three experimental conditions.

After completing the series of passages, the subject returned to his classroom and sent in the next scheduled student.

Scoring. The number of consecutive words which the subject reported having seen (i.e. the amount of the sentence he completed beyond the light-out point) was recorded for each critical sentence. This measure was operationally defined as the eye-voice span. Note was made of the condition under which each of the selections was read, and of the sentence position of the critical sentence in the passage. The time until the light-out point was likewise recorded, later to be converted to a rate score in terms of number of words read per second.

RESULTS

The basic hypothesis testing the responsiveness of the EVS to the three types of instructions was tested by an analysis of variance with the classifications, grade and condition. The means and summary ANOVA are given in Table 1. Both main effects, grade level and instructions, are significant; the interaction is not. Instructions

Insert Table 1 near here

to read carefully resulted in the shortest EVS (3.69 words), normal reading next and skimming in the longest.

The grade means are a bit more complicated. Second graders have the shortest EVS and eleventh graders the longest. The fourth and ninth grades reverse the expected order. It should be recalled that the second and fourth graders read second grade materials and the two older grades read tenth grade prose. This suggests that the lower than expected EVS score for the ninth graders was due to the relative difficulty of their reading materials.

There were different numbers of boys and girls in the various grades. The possibily suggested itself that the grade level differences in EVS were due to the larger proportion of girls in the upper grades. In fact, the overall EVS for girls is larger than for boy ($t=1.88$, $p < .10$). Consequently a second ANOVA was calculated which included "sex" as a classification. In order to equalize the cell frequencies the ninth and eleventh grades were combined. Again, the main effects of grade and instruction conditions are significant; sex means differ at the 10% level. No interactions are noteworthy. We conclude, then, that the findings are not attributable to the different representations of boys and girls at the various grade levels.

Reading Rate and EVS. Because of the previous finding that EVS and rate are positively correlated, (Levin and Turner, 1966) it was expected that such relationships would hold in the present experiment. Thus rank order correlations between EVS and rate were performed for each instructional condition among the subjects of the second, fourth and ninth grade. (Time scores for the eleventh grade were unavailable due to a mechanical failure of the timing apparatus.) Table 2 shows the

Insert Table 2

rho values for each of these correlations, all of which are significant beyond the .05 level of confidence. At least within the condition and grade, then, the eye-voice spans and reading rates of the subjects are highly correlated -- the faster readers exhibiting the longest EVS's in each condition.

It would be expected, on the basis of this consistent co-variation, that instructional condition would produce in the reading rate a comparable effect with that produced in the eye-voice span; i.e. that the careful condition would decrease the rate of reading, and the general idea condition increase the rate beyond the normal rate. Surprisingly, a comparison of the average reading rates yielded for each condition by grade (Table 3) does not show such effects. Although

Insert Table 3

there seems to be an overall increase in rate from the second to fourth grades, the rates are fairly constant despite instructional differences.

DISCUSSION

The main concern in this study, that of instruction-induced motivational set upon the eye-voice span, appeared as expected from the similar results of eye-movements studies of silent reading by Gray, Judd and Buswell, and Anderson. The shorter EVS obtained from the careful reading condition seems to indicate that the subject uses smaller chunking units, focusing more closely and exclusively on each word. In terms of the eye-movement measures utilized by these other experimenters, the increased number of fixations, the small forward shifts, the increased number of regressions may all be seen as involved in the decreased EVS length. As Anderson describes the process:

> In order to satisfy a more severe requirement of comprehension, a more deliberate and careful scrutiny of the reading material was necessary; this was immediately reflected in the eye-movements.... The irregularities of eye-movements found in this reading situation are not comparable to the erratic and inconsistent eye-movement behavior of the immature reader. The peripheral signs in this situation are rather a characteristic pattern which reflects an increasing dependance upon the reading material and a peculiar mode of attack necessary to satisfy the requirement of comprehension.

One other factor which may have entered as a contributing cause of the shortened EVS under this instructional set is that of increased tension or anxiety. Vernon maintains that any such pressure (as here may have occurred due to the interrogations to follow the reading of the selections) may result in more erratic and confused reading processes, which would decrease efficiency. However, since the questions were handled very casually, without scoring, and almost jokingly if the subject appeared nervous, it is suspected that any such effect would have been minimal.

In the condition where the subject's purpose was to read for the general idea, the opposite tendencies were exhibited, as was predicted from the earlier reports. The eye seemed to scan well ahead of the voice, producing a general forward tendency. Subjects were noticed to exhibit less regression and repetition and to be less bogged down with individual troublesome words. Without any anxiety, subjects in this condition could perhaps read more freely. Anderson understands the differential reading habits to be a function of the different number of kinds of cues necessary to satisfy the requirements of a particular reading situation. In this case,

> since the objective cues necessary to reproduce the general idea are fewer than those required in the other reading situations, the effective reader will show considerable independence of the printed page. The subsequent reduction in the number of fixations indicates that the comprehending activities are enhanced and contribute more to the successful realization of the task than would a careful and deliberate exposure to the reading material.

As there was no mention of a quickened speed in this condition, the instructional effects seem to have been confined to the types of eye-movements that occurred rather than to producing the overall accelerated pace which usually goes hand-in-hand with an extended eye-voice span.

Looking at the mean scores for the normal condition, and comparing these with the mean EVS's obtained under careful and general idea reading sets, it becomes apparent that in the early grades, the normal score is very close to the careful one, whereas, on the high school level, it is the general idea condition which produces results

more similar to normal. This seems to suggest the fact that normal reading for the beginning readers entails a process very similar to that which is customarily utilized for detailed reading; that is, the reading is word-by-word, with close attention to the individual word, and without much forward scanning. Contrarily, older readers ordinarily read for the general idea; thus, this attitude is close to normal for them. (Of course, their reading is generally silent rather than oral, but the similarity of attitude, if not an identity of process, between the general idea condition and the usual skimming condition of silent reading, is obvious.) Anderson tends to support this explanation, citing the "inability of poor readers to adopt any other than their everyday reading attitude. Good readers, he continues, "on the other hand, showed their most regular eye-movement patterns in reading for the general idea." Effective reading for the general idea, according to Anderson, is a highly refined skill which presupposes a mastery of certain basic fundamental skills, like word recognition, knowledge of vocabulary and sentence meaning. Unless these elementary skills have been mastered, and can function with a minimum of effort, the reader will fail to make the necessary psychological transition which reading for the general idea requires. In Anderson's good readers, and in the more mature readers of the current study, these skills are well developed and therefore these subjects succeeded in adjusting their reading attitude to comply with the more subtle interpretation demanded of the material. Immature readers, highly engrossed in the elemental concerns, tend to read all the material in almost the same manner.

In sum, there seems to be a notable flexibility of eye-voice span, reflecting changes in the central processes of apprehension and comprehension. Eye-movements appear to be dictated by conscious processes, activated subsequent to the instruction-induced set for the purpose of reading. By implication, and in view of the apparent direction of the relationship between eye-movements involved in the eye-voice span and the conscious attidudinal determinants, it seems that earlier attempts to improve reading through eye-movement training were using the wrong approach.

The results dealing with the rate of reading do not lend themselves to such clear-cut and consistent interpretation. The fact that rates were found to correlate significantly with the EVS of subjects within grade and condition classifications may be construed simply as another replication of the repeated finding that EVS varies directly with the ability of the readers, since Morton utilizes rate as an index of ability. Here, then, the fastest readers in each classification had the longest EVS's.

However, it was not expected, in view of the fact that EVS and rate normally go hand-in-hand, that no significant changes would occur among reading rates for the different instructional conditions. This would seem to indicate that while the instructions did not effect the rate of the verbal enunciation of the passage, the effect was confined to the movement of the eyes, serving to push these further ahead of the spoken word. The rate of oral reading is limited by the rate of articulation.

Any such conclusion cannot, however, be considered definitive due to the several methodological difficulties presented by these rate measures. In the first place, a mechanical failure in the timing apparatus was responsible for the omission of all rate scores of the eleventh grade subjects. Even excluding this group of scores, the reading rates are not very accurate due to inconsistent behavior of the subjects. Often the children would go back and repeat parts or whole sentences, or would make comments to the experimenter, all while the timer was running, thus producing unreal inflations of the rate scores. Other subjects sometimes omitted entire sentences completely, thereby unrealistically decreasing their computed rates.

SUMMARY

In the present experiment, the effects of different instructionally-induced sets upon the eye-voice spans of readers at various elementary and high school levels was investigated. It was hypothesized that:

(1) The set for detailed reading would result in a decrease in EVS length, caused by the smaller-than-normal chunking units utilized in this type of reading; whereas reading for a general idea (skimming) would yield a longer EVS than normal.

(2) The EVS would increase in length with the grade level of the subjects.

Primarily, then, this experiment has demonstrated that different instructions produce significant changes in the reading behavior of school children. The EVS was shown to vary with instructions in the same ways as eye movements, as was indicated in a number of earlier studies.

REFERENCES

Aborn, M., Rubenstein, H. & Sterling, T. Sources of contextual constraint upon words in sentences. J. Exp. Psychol., 1959, 57, 171-180.

Anderson, I. H. Eye-movements of good and poor readers. Psychol. Monog., 1937, 48, 1-35.

Ballantine, F. A. Age changes in measures of eye-movements in silent reading. In Studies in the Psychology of Reading. U. of Michigan Monographs in Education. No 4. Ann Arbor: U. of Mich. Press, 1951, 65 - 111.

Buswell, G. T. An experimental study of eye-voice span in reading. Suppl. Educ. Monog., 1920, no. 17.

Cattell, J. McK. Mind, 1889.

Clark, H. H. Some structural properties of simple active and passive sentences. J. Verb Learn. Verb. Behavior., 1965, 4, 365 -370.

Fairbanks, G. The relation between eye-movements and voice in oral reading of good and poor readers. Psychol. Monog., 1937, 48, 78 - 107.

Gray, C. T. Types of reading ability as exhibited through tests and laboratory measurements. Suppl. Educ. Monog., 1917, 1, no. 5.

Huey, E. B. On the psychology and physiology of reading. Am.Jrnl. Psychol., 1901, XII, 292 - 313.

Huey, E. B. The psychology and pedagogy of reading. New York: MacMillan, 1922.

Judd, C. H. Reading: its nature and development. Suppl. Educ. Monog., 1918, no. 10.

Judd, C. H. and Buswell G. T. Silent Reading; a study of the various types. Suppl. Educ. Monog., 1922, no. 23.

Lawson, E. A note on the influence of different orders of approximation to the English language upon eye-voice span. Quart. J. Exp. Psychol., 1961, 13, 53 - 55.

Laycock, F. Significant characteristics of college students with varying flexibility in reading rate. I - Eye-movements in reading prose. J. Exp. Educ., 1955, 23, 311 - 330.

Ledbetter, F. G. Reading reactions for the eye-movements of eleventh graders. J. Educ. Res., 1947, 41, 102-115.

Levin, H. and Kaplan, E. Studies of oral reading: the eye-voice span for active and passive sentences., 1966.

Levin, H. and Turner, E.A. Studies in oral reading: sentence structure and the eye-voice span., 1966.

Morse, W. S. A comparison of the eye-movements of average fifth and seventh grade pupils' reading materials of corresponding difficulty. In Studies in the Psychology of Reading. U. of Mich. Monog. in Educ. No. 4. Ann Arbor: U. of Mich. Press, 1951, 1 - 64.

Morton, J. The effects of context upon speed of reading, eye-movements and eye-voice span. Quart. J. Exp. Psychol., 1964a, 16, 340-354.

Quantz, J. O. Problems in the psychology of reading. Psychol. Monog., 1897.

Roberts, K. The interaction of normative associations and grammatical factors in sentence retention. Paper read at MPA, Chicago, 1966.

Schlesinger, I. M. Sentence Structure and the Reading Process., In press, 1966.

Tinker, M. A. Recent studies of eye-movements in reading. Psychol. Bull., 1958, 55, 215-231.

Vernon, M. D. The Experimental Study of Reading. Cambridge: University Press. 1931

Table 1.

Mean EVS (words) and ANOVA by Grade and Instructional Condition

	Grade			
Instructions	2	4	9	11
Normal	2.95	4.32	3.97	4.64
Careful	2.92	4.04	3.73	4.09
Skimming	3.09	4.59	4.07	4.82

	SS	df	MS	F	P
Grades	62.24	3	20.75	5.83	<.01
Error(b)	199.32	56	3.56		
Instructions	6.14	2	3.07	10.59	<.01
Gr. x Instr.	1.69	6	.28		
Error(w)	32.84	112	.29		
Total		179			

Table 2.

Rank Order Correlations of EVS with Rate

Condition	2nd grade	4th grade	9th grade
Normal	.86	.52	.68
Careful	.84	.75	.80
Skimming	.67	.52	.81

Table 3.

Mean Rates (Words / Sec.) by Grade and Instructions

	*Grade		
Condition	2	4	9
Normal	1.58	2.31	2.59
Careful	1.59	2.27	2.53
Skimming	1.52	2.19	2.69

*Time measure were not available for the 11th grade.